

## **Title: Our Grand Old Flags**

### **Brief Overview:**

This learning unit integrates the disciplines of social studies (economics and history) and mathematics (data analysis). Students will collect and organize data about our American flag. As a part of the introduction to this learning unit, the teacher may choose to activate prior knowledge by asking such questions, as: Has our American flag always looked as it does now? or When and where do you see the American flag displayed?

### **Links to NCTM 2000 Standards:**

- **Standard 1: Number and Operation**

Mathematics instructional programs should foster the development of number and operation sense so that all students understand numbers, ways of representing numbers, relationships among numbers, and number systems; understand the meaning of operations and how they relate to each other; and use computational tools and strategies fluently and estimate appropriately.

- **Standard 5: Data Analysis, Statistics, and Probability**

Mathematics instructional programs should include attention to data analysis, statistics, and probability so that all students pose questions and collect, organize, and represent data to answer those questions; interpret data using methods of exploratory data analysis; and develop and evaluate inferences, predictions, and arguments that are based on data.

- **Standard 6: Problem Solving**

Mathematics instructional programs should focus on solving problems as part of understanding mathematics so that all students build new mathematical knowledge through their work with problems; apply a wide variety of strategies to solve problems and adapt the strategies to new situations; and monitor and reflect on their mathematical thinking in solving problems.

- **Standard 7: Reasoning and Proof**

Mathematics instructional programs should focus on learning to reason and construct proofs as part of understanding mathematics so that all students recognize reasoning and proof as essential and powerful parts of mathematics.

- **Standard 8: Communication**

Mathematics instructional programs should use communication to foster an understanding of mathematics so that all students organize and consolidate their mathematical thinking to communicate with others; express mathematical ideas coherently and clearly to peers, teachers, and others; extend their mathematical knowledge by considering the thinking and strategies of others; and use the language of mathematics as a precise means of mathematical expression.

- **Standard 9: Connections**

Mathematics instructional programs should emphasize connections to foster an understanding of mathematics so that all students recognize and use connections among different mathematical ideas; understand how mathematical ideas build on one another to produce a coherent whole; and recognize, use, and learn about mathematics in contexts outside of mathematics.

- **Standard 10: Representation**

Mathematics instructional programs should emphasize mathematical representations to foster an understanding of mathematics so that all students create and use representations to organize, record, and communicate mathematical ideas.

**Grade/Level:**

Grades: 3-5

**Duration/Length:**

This unit will take approximately 4-5 class periods (60 minutes each).

**Prerequisite Knowledge:**

Students should have working knowledge of the following skills:

- Weighing mass to the nearest pound
- Adding with regrouping
- Choosing appropriate problem solving strategies
- Constructing line plots
- Comparing information on a Venn diagram
- Calculating range, mean, mode, and median
- Writing a business letter

**Student Outcomes:**

Students will:

- collect, organize, interpret and analyze data.
- work cooperatively in groups.
- construct a line plot.
- construct a stem and leaf plot.
- write a letter to persuade.
- participate in class discussions.
- calculate median, mode, mean, and range.

**Materials/Resources/Printed Materials:**

- The Biggest and Best Flag That Ever Flew by Rebecca C. Jones
- Student Resource Sheets #1 - #8
- Teacher Resource Sheets #1 - #6
- Transparency of Teacher Resource #1
- Sample flag (See Student Resource #6)
- Assorted markers
- Large graph paper
- Scales
- Individual math journals
- Red, white, and blue construction paper
- White star stickers
- Scissors
- Glue sticks
- Calculators

- Music for “The Star Spangled Banner” and/or “You’re a Grand Old Flag.”
- Stop watches (1 per pair)

## Development/Procedures:

### Activity 1

- The student will listen to a rendition of “The Star Spangled Banner.”
- The teacher will read aloud The Biggest and Best Flag That Ever Flew by Rebecca C. Jones.
- The students will weigh and measure the length and the width of the classroom flag.
- The students will independently complete a Venn diagram (Student Resource #1) comparing the classroom flag with the story flag.
- The students will orally share their responses while the teacher records them on Teacher Resource #1.
- The students will work in pairs to weigh each other. Each student will record his or her weight in pounds on one of the figures on Teacher Resource #2. **The teacher may choose to ask for volunteers to be weighed as some students are sensitive about their weight.**
- The students will use the weight data on Teacher Resource #2 to construct a class line plot on large grid paper or on the chalk board. (Using the actual cut-outs to represent values on the line plot can be motivating.)
- The students will discuss and calculate the range, median, mode, and mean of the class data. The students’ work should be recorded in their math journals. The teacher can ask: Which measure of center mode, median, or mean represents the typical class weight? Additional discussions may include new vocabulary words such as outlier, clusters, and gaps.
- The students will analyze the line plot graph to determine which combination of classmates comes closest to the weight of the flag in the story. Use Student Resource #2. Results will be shared in cooperative groups.
- The teacher will present the independent student packet. (Student Resources #3, 4, and 5) This will be used to assess the students’ ability to organize data in a line plot. See Teacher Resource #3 for rubric.

### Activity 2

- The teacher displays Vignette 2 (Teacher Resource #4), titled “Our Grand Old Flags.” The teacher encourages the students to discuss the vignette.
- The teacher will distribute the “Flag Assembly Instructions.” (Student Resource #6)
- The students will read the directions and examine the sample. (Teacher-made)
- Each student will make one flag to practice the step-by-step construction.
- The students will work in teams of two. As one person constructs a flag, the other records the time in seconds that it takes to completely construct the flag. The students switch jobs. Now another flag is made and the construction time is recorded.
- The teacher will ask the students how to organize and display their times. (Line plots) The students will make a class line plot with all of the flag construction times. There will probably be a wide range of data that points out the necessity of displaying the data a different way.

### Teacher Information

*A stem and leaf plot is a data display based on place value. It lists the greater value digits vertically “on the stem” and the lesser place value digits horizontally “on the leaves.” See the example below.*

### Data Set

27, 31, 42, 30, 36, 31, 24, 39, 40, 33, 54, 24,  
35, 46, 35, 49, 41, 36, 38, 43, 37, 33, 37

Record the data in the sequence as it is presented.

2		7	4	4															
3		1	0	6	1	9	3	5	5	6	8	7	3	7					
4		2	0	6	9	1	3												
5		4																	

Note: The data displayed is not in sequential order. On a new plot, arrange the leaves so they are in order from the smallest value to the largest value. Be sure to include a title and a key. ex. key 2|4 = 24 sec.

- Using the think aloud strategy, the teacher will model making a stem and leaf plot with the flag construction times.
- Using the teacher-modeled stem and leaf plot, the students will analyze their findings.
- The students will calculate the number of flags that each person could make in one hour. [Students will need to determine the number of seconds in an hour. (60 seconds x 60 minutes in an hour = 3600 seconds) Then, the students will divide 3600 seconds by the time it takes to construct one flag.]
- The students will calculate the range, median, mode, and mean in their math journals.

### **Activity 3**

- The students will recall the previous activity of making a stem and leaf plot. The teacher will pose the question: “How can we increase flag productivity?”
- The students will use the cooperative learning strategy of Think, Pair, Share to respond.
- The teacher will choose 8-10 students to demonstrate the productivity level of making flags on an assembly line. Allow the assembly line to produce flags for 5-7 minutes.
- The students will share their observations of the assembly line.
- The teacher will share the data on Mr. Star’s class’ assembly line. (Student Resource Sheet #7) The teacher may lead a discussion that includes vocabulary words such as interdependence and specialization. (Economic terms)
- The students will independently complete a stem and leaf plot with the data from Mr. Star’s class.
- Students will calculate the range, median, mode, and mean using the data from Mr. Star’s class.
- The students will compare the productivity of the two groups. (Student Resource #7)
- Using the data from the stem and leaf plot, the students will write a business letter to Ms. Banner to persuade her to construct her company’s flags either by a single worker or by an assembly line. (See Student Resource #8, Writing Prompt)

### **Performance Assessment:**

This unit provides ongoing assessments that include the construction of stem and leaf plots. Rubrics are provided in Teacher Resources #5 and #6.

**Extension/Follow Up:**

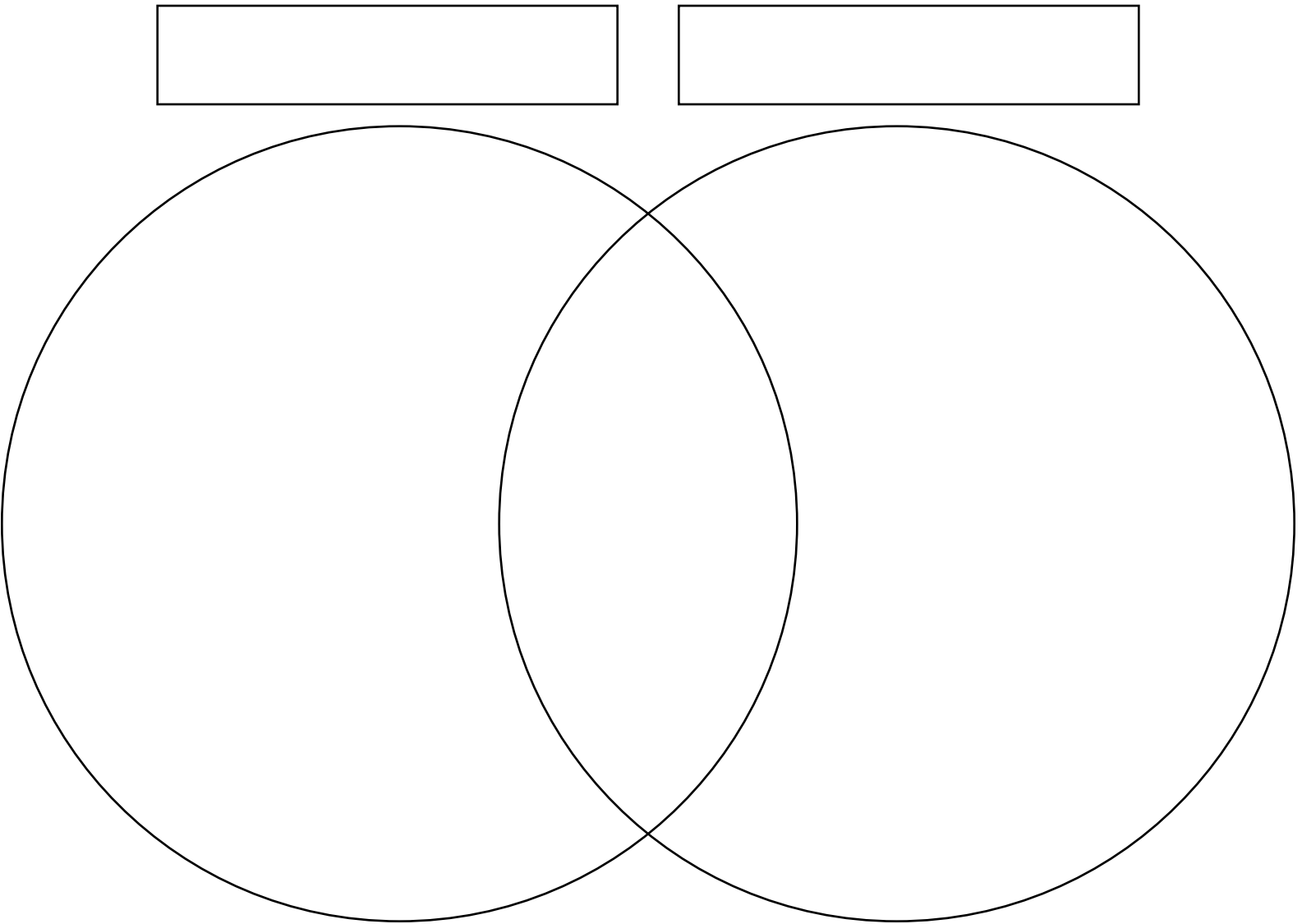
- Activity 1 can be extended by having the students calculate the range, mean, mode and median of the class weights and/or student performance assessment on Student Resource Sheet #4.
- The students could write a creative paragraph explaining how Caroline Pickersgill and her mother moved the 200 pound flag to complete the sewing of it.
- The students can take a field trip to the Museum of American History to view the flag made in the story. (Presently, the flag is being restored and is not on display.)
- The students can take a field trip to Fort McHenry to experience the setting of The Biggest and Best Flag That Ever Flew. A reproduction of the flag is available for students to hold if you call ahead and make a special request of the National Park Service.
- Rebecca C. Jones, the author, lives in Maryland. The students can write the author for various purposes.
- The students can continue to compare the information about the two flags by referring to the previously constructed Venn diagram. The students can use the data to compute the perimeter of both flags. The students can use the data to compute the area of both flags.

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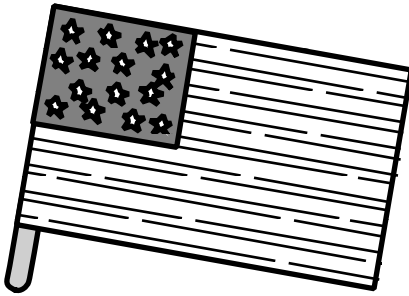
Melissa Rafter  
Pointers Run Elementary  
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Student Resource #1  
Venn Diagram



Name \_\_\_\_\_

Directions: Choose a problem solving strategy, such as guess and check, to determine which combination of classmates comes closest to the weight of our original "Star Spangled Banner."



equals 200 pounds

Which combination of our classmates weight equals 200 pounds?  
Show your work here:

## Vignette 1

As we read in the story, The Biggest (and Best) Flag That Every Flew by Rebecca C. Jones, Caroline Pickersgill and her grandmother made flags for American ships during the War of 1812. Today, American flags are found everywhere. Many people display the American flag as a symbol of our freedom and national pride.

After hearing that his students were learning about the American flag in social studies, Mr. Star wanted to find out the average number of American flags his students' families owned, including any household items the flag was on, such as key chains, clothing, and picture frames. Mr. Star surveyed his math class. His survey question was: How many American flags does your family own? Mr. Star then displayed the data in a table. However, Mr. Star sprained his wrist and was not able to finish the table, organize his data, and find the average number of American flags his students' families owned.

Mr. Star needs your help! Use your knowledge about data collection to help Mr. Star. Your task is to complete the table, display the data in a clear way, and find the average number of American flags his students' families own.

Prediction: How many American flags do you think one family owns? \_\_\_\_\_

Complete the attached activities.



Directions: Complete Mr. Star's Table.

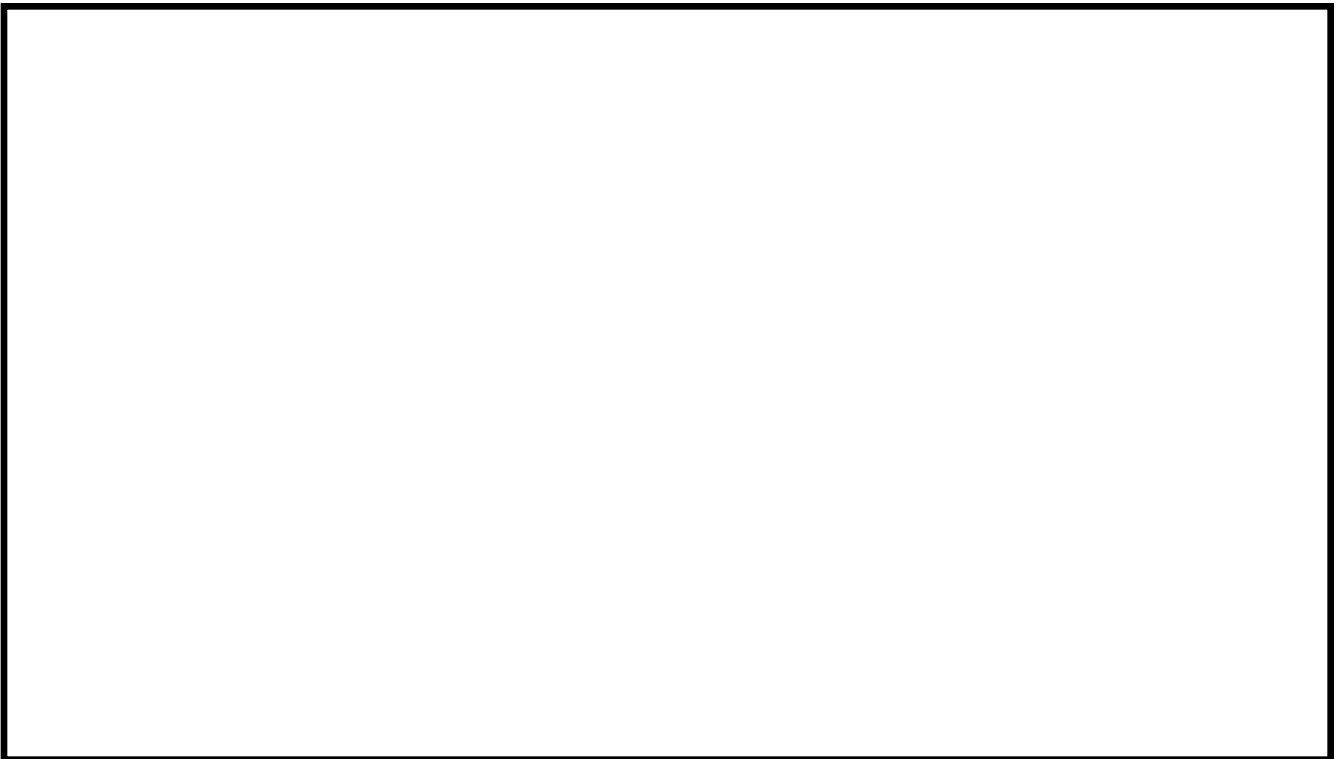
Student Name	Tally Marks	Number of Flags
Tamika	II	
Megan		
Arian	I	
Lee	<del>III</del> I	
Kim	II	
Theresa	IIII	
David	I	
Kamini	I	
Meera	II	
Chris	<del>IIII</del>	
Jimmy		
Phaedra	<del>IIII</del> IIII	
Jon	III	
Shari	<del>IIII</del> III	
Mark	III	
Melissa	II	
Todd	III	
Ian	I	
Korrin	I	
Judy	II	

Construct a line plot below to display Mr. Star's data. Remember to include a title, label the X-axis, and use an appropriate scale.

Using your line plot, calculate the range, median, mode, and mean. Show all your work.



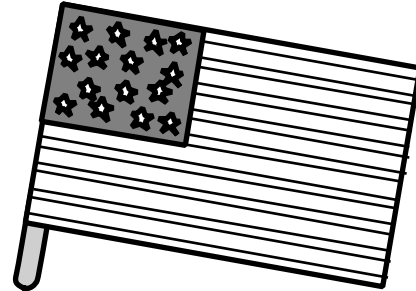
What is the average number of American flags owned by the students' families in Mr. Star's class? \_\_\_\_\_ How do you know? Write an explanation below to explain your answer. Be sure to use numbers and words. Also, include how this data compares to your prediction.



## Flag Assembly Instructions

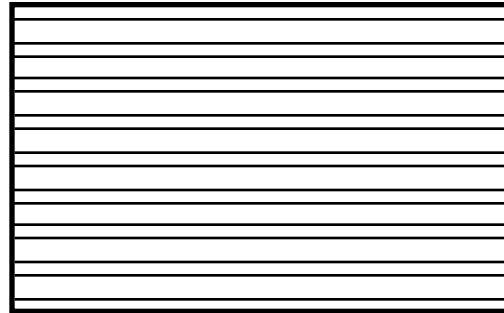
Broad Stripes and Bright Stars, Inc  
*Materials List for Each Flag*

- 1- 8 1/2" x 11" white paper
- 15 white star stickers
- 8- 11" x 1/2" red stripes
- 1- 5" x 5" blue square
- 1 wooden craft stick



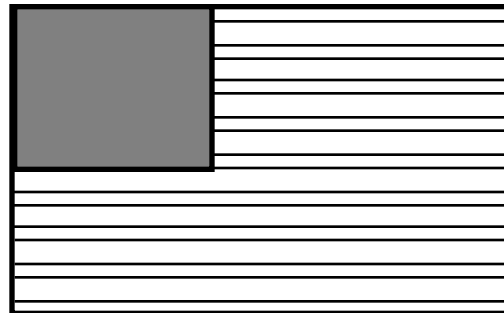
### Step 1

Glue the 8 red stripes on the white paper.



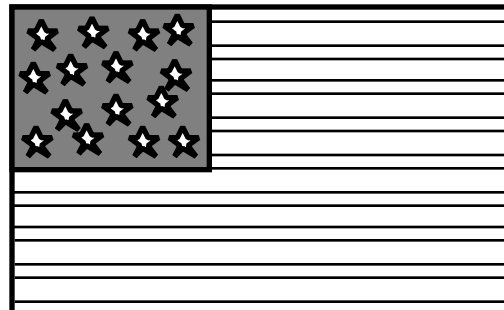
### Step 2

Glue the blue square on top of the red and white stripes.



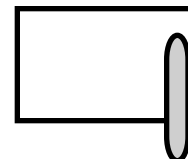
### Step 3

Attach the 15 white star stickers in a random pattern on the blue square.



### Step 4

Glue the wooden craft stick to the back side of the flag.



Mr. Star had his students work with friends in an assembly line to make as many flags as they could in one hour. The results for each group are: Tamika- 36, Megan- 57, Arian- 20, Lee-16, Kim-89, Theresa-33, David-35, Kamini-94, Meera-51, Chris-66, Jimmy-73, Phaedra-41, Jon-58, Shari-24, Mark-19, Melissa-61, Todd-90, Ian-46, Korrin-37, and Judy-14.

Make a stem and leaf plot to organize and display this data.

What is the average number of flags made in one hour by an assembly line? \_\_\_\_\_

Compare this data to the average number of flags made in one hour by a single worker. Support your answers with mathematical data.

## Writing Prompt

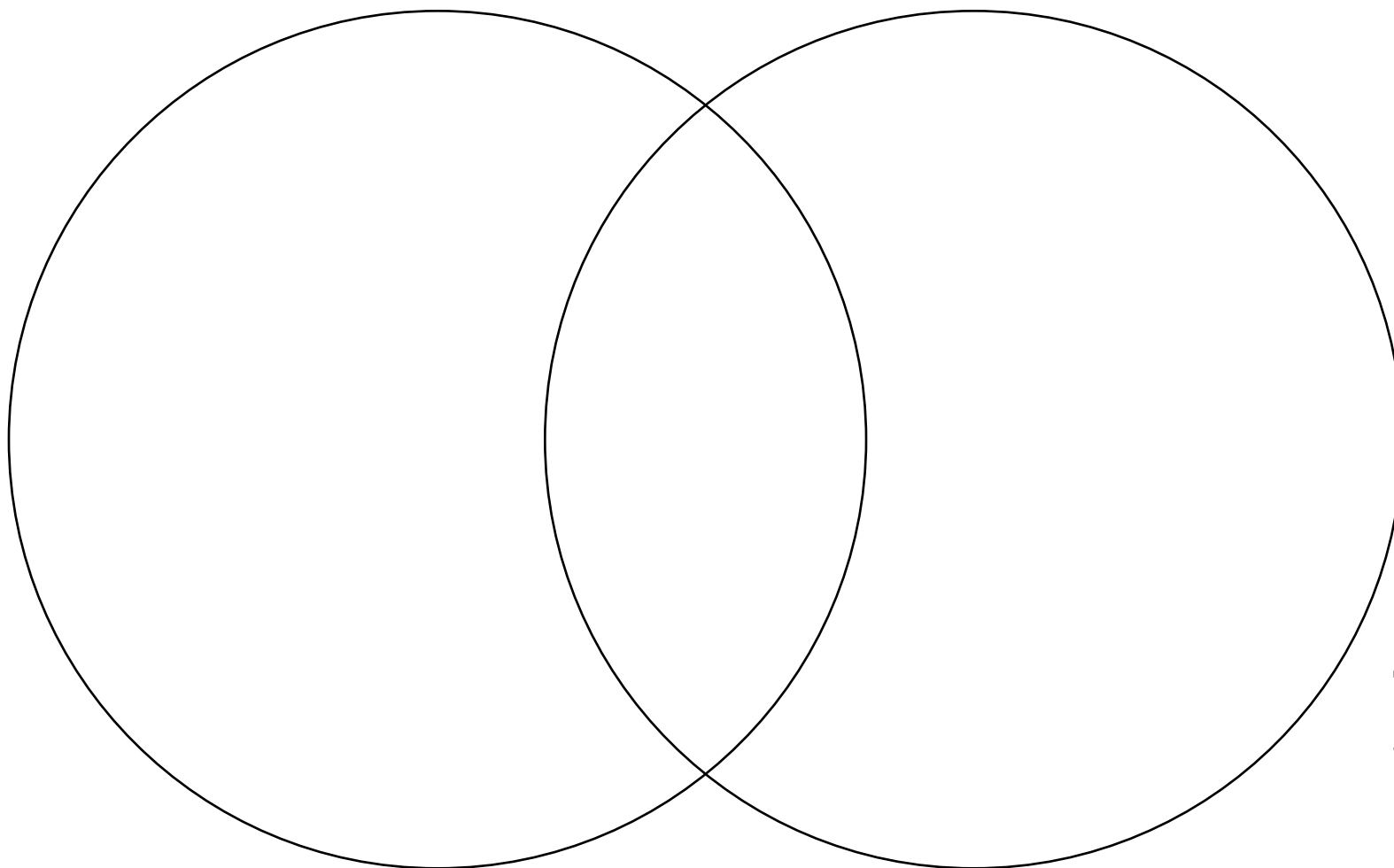
Ms. Banner is interested in your data analysis. She would like to find out if her employees should work independently to make flags or work on an assembly line. She wants her employees to make as many flags as possible in one hour.

Based on your data analysis, write a business letter to persuade Ms. Banner to use a single employee or an assembly line.

Remember to use a business letter format. Be sure to include your position statement, 3 supporting ideas, and your conclusion. Don't forget to proofread for capitalization, grammar, punctuation, and spelling.

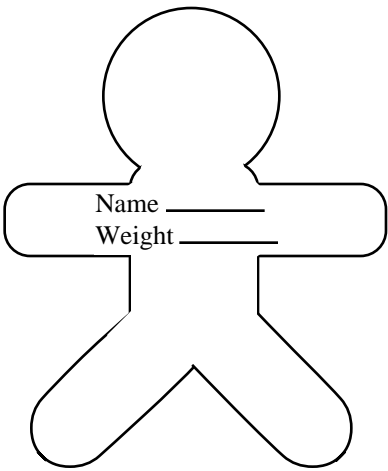
Our Classroom Flag

Original Star Spangled  
Banner

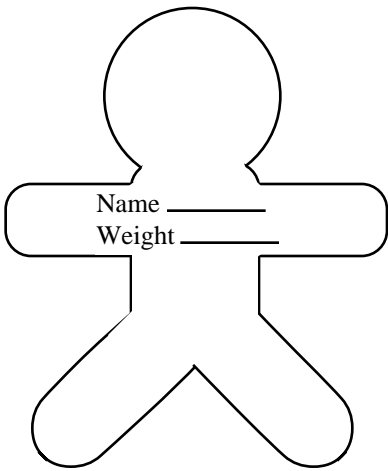


Teacher Resource #1  
Transparency

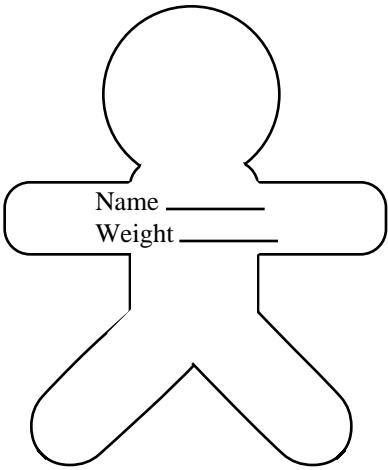
Teacher Resource #2  
Students For Line Plot



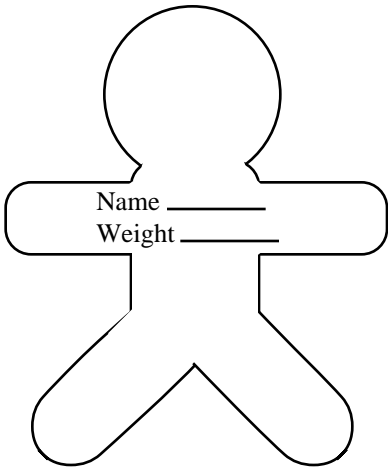
Name \_\_\_\_\_  
Weight \_\_\_\_\_



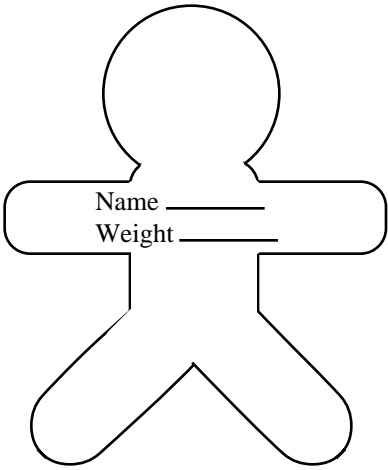
Name \_\_\_\_\_  
Weight \_\_\_\_\_



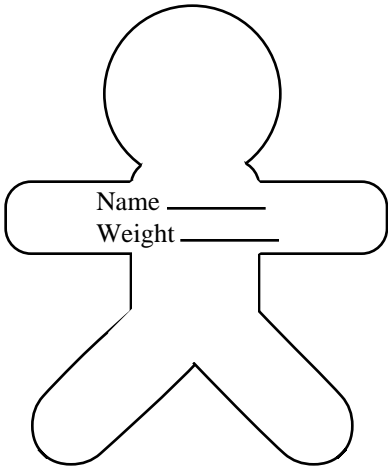
Name \_\_\_\_\_  
Weight \_\_\_\_\_



Name \_\_\_\_\_  
Weight \_\_\_\_\_



Name \_\_\_\_\_  
Weight \_\_\_\_\_



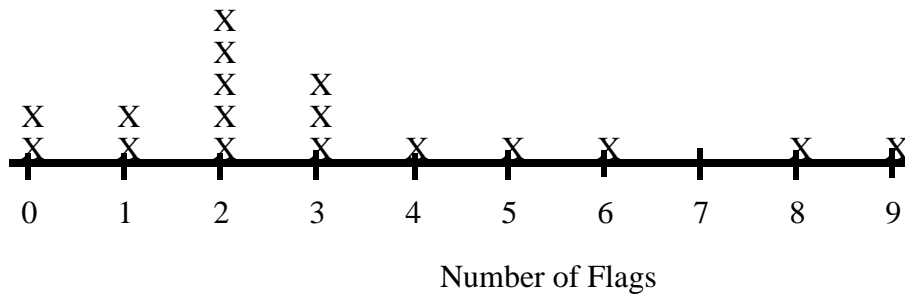
Name \_\_\_\_\_  
Weight \_\_\_\_\_

## Rubric for Line Plot

- 2
- All information is accurately included.
  - Graph is titled.
  - X – axis is labeled.
  - An appropriate scale is used.
  - The graph is neat, well organized, and attractive.
- 1
- At least 3 of the above criteria have been met.
- 0
- Less than 3 of the above criteria have been met.

### Mr. Star's Students' Flags

sample line  
plot





## Vignette 2: Our Grand Old Flags

Broad Stripes and Bright Stars, Inc. is opening a new manufacturing plant in Maryland just in time for the Fourth of July celebrations. The CEO, Ms. Banner, knows that this is a time of year when many people purchase American flags. To be sure her company can fill the orders, she would like to compute the number of American flags that can be constructed in one hour. Ms. Banner wants to find out if her employees should work independently or in teams to make flags. She wants her employees to make as many flags as possible in one hour.

Let's predict the number of flags that can be produced in one hour.

Should the flags be constructed by a single worker or would an assembly line be a better choice?

# RUBRIC FOR STEM AND LEAF PLOT

## 2 POINTS

- All information is accurately included.
- Plot is titled.
- The plot is neat, well-organized, and attractive.
- Leaves are ordered from smallest to largest.
- Stems and leaves accurately displayed

## 1 POINT

- At least 3 of the above criteria have been met.

## 0 POINTS

- Less than 3 of the above criteria have been met.

**Rubric**  
**Business Letter**  
**Writing to Persuade**

**2 Points**

- Position statement
- Three or more supporting statements
- Conclusion (personal statement, prediction, summary)
- Business letter format

**1 Point**

- At least three of the above criteria have been met.

**0 Points**

- Less than three of the above criteria have been met.